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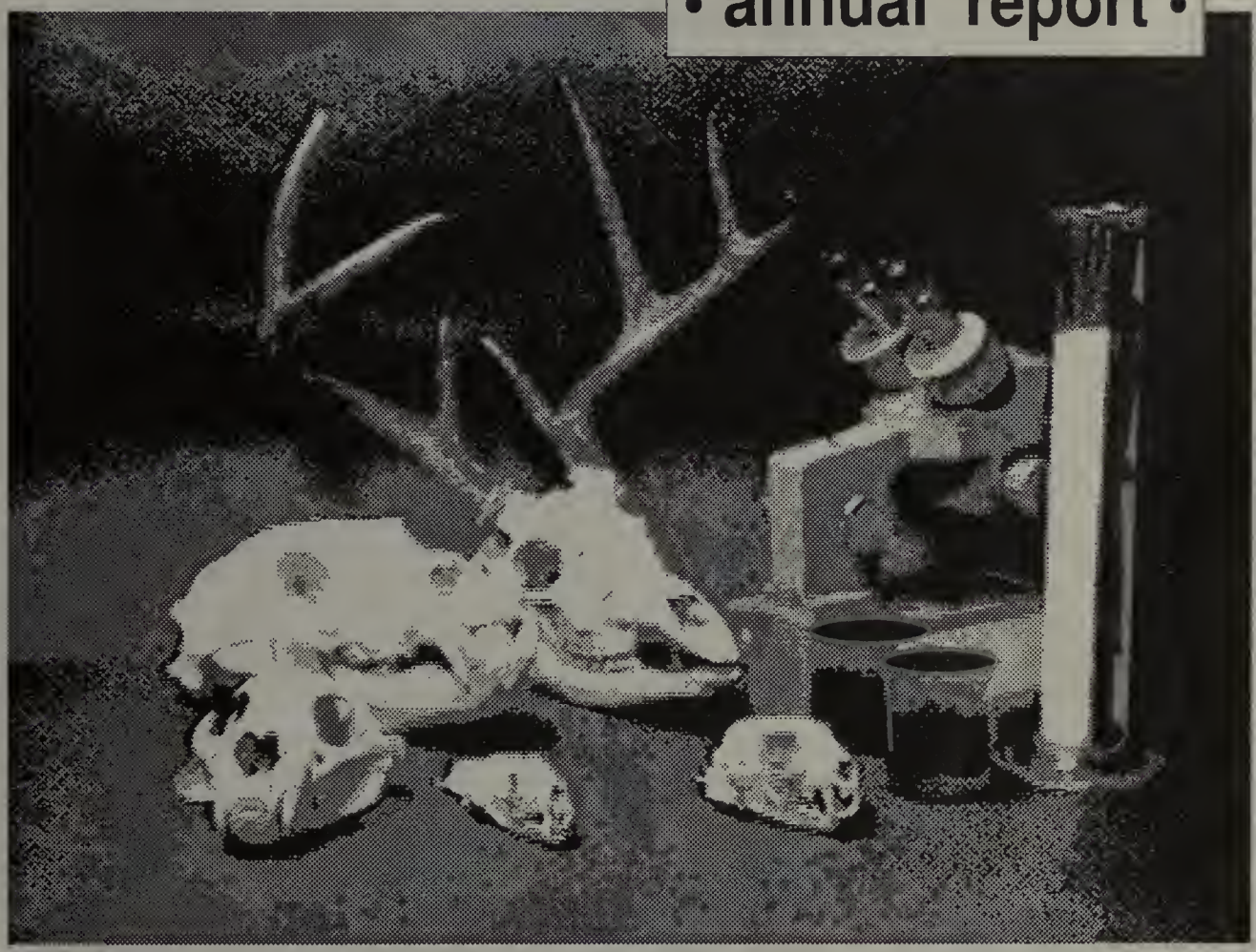

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Date: November 1, 1990

Since this is a progress report only, results presented herein are not necessarily final and may be subject to change. For this reason, the information contained in this report may not be published or used for other purposes without permission of the Director.

ABSTRACT

The Wildlife Laboratory processed 200 general wildlife specimens and 1000 hunter/trapper specimens. Approximately 1700 big game and furbearer samples were analyzed for food habits. Blood samples from over 600 animals of several species were analyzed for disease and chemistry profiles. Blood serum and reproductive tracts from 400 animals of several species were analyzed for reproductive performance. Approximately 500 skulls were processed. Over 900 teeth were processed for age determination by cementum annuli counts. Ages were determined for 750 pine marten and 191 mountain lion. Tests were conducted on aging techniques for these two species. Animal immobilization throughout the state was coordinated. Biological measurements, blood, and tissue were collected from bison harvested during the 1989-90 season. Forty-one animal necropsies were conducted on a variety of species. Duck wings were again collected from cooperating hunters. A total of $14,908 was grossed during the sale of 96 hides, heads, and other items auctioned in the annual trophy sale. Forty-three requests for reference specimens and educational material were processed. The biotelemetry frequency database was updated and results reported to the FCC frequency coordination committee. Work continued on monitoring of wildlife parasites through cooperation with the Veterinary Molecular Biology Laboratory. Special research conducted included mountain lion studies, pine marten studies, and grizzly bear studies. Wolf, mountain lion, and grizzly bear mortalities were recorded. Management recommendations are presented.

INTRODUCTION

The Wildlife Laboratory has served research and management in this state since 1955. The laboratory provides important services to wildlife biologists in Montana and conducts critical research on topics which must be investigated within a laboratory setting. Its history has been dynamic, developing with the ever changing needs of the wildlife scientists within the state.

The Wildlife Laboratory activities serve many functions. The work at the laboratory produces valuable resources used in the MDFWP information and education programs. It provides data and conducts research important to decision makers in wildlife management programs. The laboratory coordinates with other laboratories conducting similar work in neighboring states and within the state. In addition, work at the wildlife laboratory assists law enforcement personnel during investigations of wildlife crimes.

This report summarizes the results of laboratory investigations for the period from July 1989 to July 1990. The work conducted is ongoing and will continue into next fiscal year.

JOB OBJECTIVES

1. Provide wildlife laboratory services to management and research biologists through determination of food habits, reproductive status, sex, and age of wildlife specimens submitted from throughout the state.

2. Necropsy wildlife specimens suspected of being diseased, parasitized, or dying of unknown causes to identify the probable cause of death. This includes submitting various tissue samples to appropriate laboratories for testing if warranted.

3. Coordinate and supervise the department's wildlife immobilizing drug program and conduct research on new drugs as they become available.

4. Maintain and add to reference collections of plant and animal materials.

5. Coordinate the department's wildlife/pesticide program.

6. Coordinate and maintain a central file of radio frequencies being used to mark various species of wildlife throughout the state.

7. Obtain and prepare specimens to fill requests for study skins, tanned hides, mounted specimens, skulls, and other skeletal materials to be used by department personnel and others for educational displays and programs.

8. Assist other research and management biologists in construction of various animal markers and in capture and handling of animals.

9. Conduct special physiological investigations as requested:

    a. Test serological techniques of determining pregnancy in big game animals

    b. Test ultrasonic pregnancy detection devices for reliability and validity of detecting pregnancy in live big game animals

c. Relate physiological parameters of wildlife specimens to range condition, climatological factors, population structure and size, and various management strategies.

METHODS

Food habits were determined using standard laboratory procedures: sampling, identification of food items using appropriate keys and known reference materials, volumetric measurement, and storage. Findings were returned to the original collectors for tabulation, interpretation, and final reporting.

Blood samples were obtained from big game animals during regular trapping and handling of animals for research or management purposes. Hematology and blood chemistry measurements were done by the Livestock Department's Veterinary Diagnostic Laboratory in Bozeman.

Female reproductive tracts were prepared for examination, ovaries for sectioning, and bacula and testes for development. Uteri were examined for scars and embryonic or fetal tissue. Blood serum samples were submitted to the University of Idaho for measurement of pregnancy specific protein B levels.

Ages of big game animals were determined by tooth replacement and wear characteristics. Ages of bears, lions, and furbearers were determined by cementum annuli counts of sectioned teeth and/or skull characteristics.

Skulls of harvested grizzly bears and mountain lions taken statewide, and carcasses of marten from throughout Montana were required or requested to be turned in. Skulls from these animals, plus those of other lions, bears, and furbearers received in the lab, were cleaned by boiling and returned to the hunter/trapper if requested.

Hides, capes, antlers, horns, black bear claws, and elk canine teeth were sold at a public auction held in April 1990.

Bear and goat teeth were pulled, sheep and goat horns were measured, sheep horns were plugged for hunters, and furbearer pelts were tagged for trappers.

Various measurements and biological samples were taken from bison taken by hunters or FWP personnel during the 1989-90 hunting season.

Liaison was maintained with other laboratories. Emphasis of this cooperation involved necropsy of specimens to

determine cause of death and examination of wildlife for parasites and diseases. Primary labs involved are the Veterinary Diagnostic Lab and Veterinary Research Lab, both in Bozeman. Other labs to which specimens are sent include the National Wildlife Health Research Lab in Madison, Wisconsin, and the National Veterinary Services Lab in Ames, Iowa.

Duck wings were obtained from those submitted to the U.S. Fish and Wildlife Service Waterfowl Parts Survey by Montana hunters, and by direct solicitation of Montana hunters by FWP. These wings will be submitted for laboratory analysis of organocholorine pesticide and polychlorinated biphenyl residue levels. Results will be compared with those from the National Contaminant Biomonitoring Program.

RESULTS AND DISCUSSION

General Specimen Processing

A total of 200 general wildlife specimens were submitted to the laboratory for various processing (Table 1). General specimens include all non-trapper/hunter collections. Twenty-nine species were represented in the list of specimens processed during the year.

Skeletal materials processed this year included 150 mountain lion skulls, 100 pine marten skulls, 25 furbearer skulls, 50 bobcat skulls, and 60 bear skulls. One grizzly bear skeleton was collected, boned, and frozen for later cleaning.

Food Habits

Approximately 30 rumens were fixed and stored from deer studies in the Bridger Mountains and the Flathead Valley. Only one Bighorn Sheep rumen was sorted during the report period. Preparations are beginning for washing and sorting the recently collected rumens. Old sorted rumens in storage were inventoried and those over 10 years of age were thrown out. The remaining rumens sorted on the storage shelf remain for biologist to conduct species identification of contents.

Over 800 grizzly bear scat samples were collected by four field projects and presented for analysis during the report period. The samples were accessioned and analysis was conducted on contract by William Callaghan. Coordination for processing these samples was provided by the Wildlife Laboratory and results were disseminated. William Callaghan will be moving from the state and is no longer able to provide this analysis service. Laboratory aide Kevin Frey was trained to conduct the analysis assisted by the Laboratory Supervisor and Laboratory Biologist. The wildlife laboratory will

Table 1. General specimens received and processed at the Wildlife Laboratory during Fiscal Year 1989.

Species	No. Processed	Percent
Antelope	1	00.5
Bald Eagle	5	02.5
Beaver	3	01.5
Bighorn Sheep	15	07.5
Black Bear	38	19.0
Bobcat	13	06.5
Coyote	8	04.0
Elk	6	03.0
Fisher	8	04.0
Fox	1	00.5
Golden Eagle	8	04.0
Goshawk	1	00.5
Great Horned Owl	4	02.0
Grizzly Bear	20	10.0
Mink	1	00.5
Moose	1	00.5
Mountain Goat	2	01.0
Mountain Lion	23	11.5
Mule Deer	10	05.0
Osprey	1	00.5
Otter	7	03.5
Peregrine Falcon	1	00.5
Pine Marten	5	02.5
Raccoon	1	00.5
Sharp-shinned Hawk	2	01.0
Trumpeter Swan	1	00.5
White-tailed Deer	1	00.5
Wolf	4	02.0
Wolverine	9	04.5

continue to service programs needing scat analysis. Analysis was begun on 20 scat samples from the Cabinets and 100 scats from the North Fork of the Flathead River.

The B-Scat program developed by Dal Burkhalter was rewritten to provide computer summarizations of scat results on a personal computer. The program will be set up on the laboratory computer soon. Food habits databases were developed and reformatted to provide better summarization of results.

Over 650 stomach and colon samples from various species were examined and their contents determined. Approximately 90

percent of these were from marten collected during the statewide trapper harvest. Analysis of stomach and colon data is being summarized.

The U. S. Fish and Wildlife Service (FWS) submitted 219 scats collected near a wolf den in the vicinity of Marion, Montana for analysis of contents. Two of these were judged to be coyote scats, and the remainder were presumed to be wolf scats. The total scat sample was sorted into den scats or trail scats. Den scats (n=158) were collected from the immediate vicinity of the den in October 1989. Trail scats (n=59) were collected from trails near the den and the rendezvous site during August-October 1989. Detailed results of this analysis were submitted to the FWS and are summarized briefly in Table 2.

Table 2. Late spring-early fall 1989 food habits of wolves near Marion, Montana, based on examination of scats. Figures are percent frequency of occurrence/percent volume.

Food Item	Trail Scats (N=59)	Den Scats (N=158)	Total Scats (N=217)
Cattle	56/44.1	45/37.6	48/39.6
Domestic Sheep	0/0.0	2/1.4	2/1.0
Horse	3/1.7	1/Tr.[a]	1/0.5
TOTAL LIVESTOCK	59/45.8	48/38.9	51/41.0
Deer fawn/elk calf	41/27.1	52/45.2	49/39.6
Adult elk	19/5.1	0/0.0	5/1.6
Adult deer[b]	8/7.5	8/7.1	8/7.2
Unidentified adult cervid	2/0.1	3/0.1	3/0.1
TOTAL CERVIDS	71/39.7	63/52.4	65/48.5
TOTAL LARGE MAMMAL	97/85.6	95/91.3	95/89.5
Sciurids	14/6.9	9/4.1	11/5.0
Lagomorphs	5/4.5	3/1.6	4/2.6
Unidentified mice	2/Tr	2/Tr	2/Tr
Coyote	3/0.1	1/0.6	1/0.4
Unidentified canid	5/0.4	1/0.6	2/0.5
Miscellaneous mammals	0/0.0	1/0.8	1/0.6
Miscellaneous birds	20/0.4	11/0.2	13/0.3
Insect parts	14/Tr	17/Tr	16/Tr
Vegetation	30/1.9	11/0.5	17/0.9
Miscellaneous items	7/0.2	4/0.1	5/0.1
TOTAL OTHER ITEMS	54/14.4	46/8.7	48/10.4

[a] Tr denotes items comprising less than 0.05 percent of the diet
[b] Includes mule, white-tailed, and unidentified deer.

Nutrition

Blood samples were obtained from 275 elk, 140 white-tailed deer, 63 mule deer, 68 bighorn sheep, 28 moose, 13 black bear, and 1 coyote that were captured during research programs. Serum biochemistries were run on most of these samples to explore the possibility of using some of the parameters as an index to animal or herd condition. Test results were returned to the projects which submitted the samples and one copy retained in our files to be entered into a master computer database maintained at the laboratory. The data available in this master file will allow comparisons of herd condition between years and herd groups.

Animal Reproduction

Reproductive tracts were collected from various wildlife processed through the laboratory including otter, bear, lion, wolf, bobcat, fisher, and marten. Tracts are fixed and later examined to count corpora lutea and placental scars. During the report period, 13 grizzly bear, 2 otter, 2 wolf, 17 adult pine marten, and 50 juvenile pine marten tracts were examined. A contract with Dr. Phillip Wright was negotiated to help train and advise the laboratory in analysis of reproductive tracts. His assistance has been valuable in planning lab operations.

Juvenile pine marten tracts were grossly examined to check age classifications and were measured to describe physical characteristics of the reproductive tract of juvenile martens. Several martens classed as juvenile had corpora lutea suggesting that an age error had been made.

Of the 17 adult pine martens, 12 were serially sectioned at the Veterinary Diagnostic Laboratory. These tracts were initially hand sectioned and corpora lutea counts made. Tests are being conducted to determine the accuracy of hand sectioning to evaluate our laboratory technique. Work has begun on the examination of 200 additional reproductive tracts from martens classed as adult.

Serum samples from 147 elk, 86 white-tailed deer, 33 mule deer, 41 bighorn sheep, and 28 moose were submitted for pregnancy determinations based on radioimmunoassays for pregnancy-specific protein B (PSPB). This technique has proven reliable in detecting pregnancy in domestic cattle and sheep as well as in free ranging mule and white-tailed deer (Wood et al. 1986).

To confirm the accuracy of PSPB assays in elk, serum samples were obtained from 26 hunter-killed elk which were inspected internally for the presence of a fetus. Pregnancy status of

each of these animals was correctly determined by PSPB. However, one known error occurred among the 46 other elk samples. This involved a yearling male which was classified as pregnant according to the Protein B test results. Results of PSPB analysis of 75 additional samples from elk which were also rectally palpated at capture are not yet available. These additional samples will be combined with previous years results and a manuscript prepared reporting on the accuracy of this technique in elk.

Age Determinations

During the report period, 919 teeth were submitted to Matson's Laboratory for counts of cementum annuli. Six hundred and ninety-five marten teeth were X-rayed to classify juveniles from adults. Results from the determinations were filed and distributed to various programs. Results of cementum counts were compared to other aging techniques when possible.

Tests were conducted on the aging of mountain lion using cementum annuli in the premolar tooth and aging pine martens with X-Rays and cementum annuli. Results are presented in Pine Marten Studies and Mountain Lion Studies sections of this report.

Pine Marten Studies

Approximately 740 pine marten carcasses were collected during the trapping season 1989-90. Each carcass was weighed, examined, and tissues collected for various purposes. Canine teeth were extracted for aging by X-ray and later by cementum annuli counts. All full colons or stomachs were collected for food habits. Empty colons and stomachs were noted, then collected for parasite flushing at a later date. Reproductive tracts were taken from all females. Tongue and muscle tissue were taken to test for trichinella. Several carcasses were distributed to graduate students conducting pine marten research at MSU. In addition, stomach contents and reproductive tracts were examined from 1988 when collections were made in Region 3 only. All data was put onto a database for 1988, and the data entry begun for the 1989 collection. Results have not been analyzed from these data collection efforts as yet.

Age Determinations of Pine Marten

Pine marten ages were determined from cementum annuli counts for carcasses collected in 1988. X-rays were taken of these canine teeth on sheets of approximately 40-60 teeth each. The pulp cavity was measured from X-ray overhead projections, and a ratio of the pulp cavity to the tooth diameter was

calculated. The results from determining pulp cavity ratios were compared to ages determined by cementum annuli counts. Using this information, we derived a ratio that could accurately determine the juvenile age class from the radiographs.

The comparison of ages based on cementum annuli and radiographs were made using 60 female marten canines and 83 male marten canines. Pulp cavity/tooth diameter ratios greater than 30 percent were indicative of juvenile age class for male canines examined while a ratio greater than 26 percent indicated a juvenile age for females (Nagorsen et al. 1988).

Of 45 juvenile males aged by cementum annuli, five (11.1 %) were incorrectly classed. Of 36 juvenile females, 7 (19.4 %) were incorrectly classed. To correct for these errors, the ratio dividing point for juvenile age classes was raised to 35 percent. Four age classification errors (6.6%) were identified in 60 teeth examined by X-ray when a 35% ratio was used as the dividing point for juveniles and adults. This ratio assured that juvenile marten were correctly classed, and the remaining teeth were sent in for cementum annuli counts for accurate follow-up aging.

The cost of aging martens was reduced with the initial X-ray age classification and follow-up cementum annuli analysis for adults. Of 695 marten submitted for aging, 47% of the teeth were classed as juvenile, reducing the number of teeth submitted for cementum counts to 366. Each pine marten tooth was X-rayed for less than $0.20 each whereas cementum analysis costs nearly $3.00 each.

As was mentioned, 366 pine marten teeth were submitted for cementum annuli counts. The results of this analysis are pending. Preliminary analysis of radiographs indicated that the percentage of juveniles in the sample was 49.0% for males and 45.1% for females. The final juvenile proportion will be higher as results of the cementum annuli are reviewed.

Age classifications in females were verifiable using reproductive tracts as well. At least two tracts of juvenile females were found to have corpora lutea. We feel this is probably a case of an aging error. Reproductive tracts will be examined in the future to assure accurate aging. Baculum length measurements were obtained from as many males as possible to help verify the age classifications as well.

Mountain Lion Studies

Skull Characteristics of Montana Mountain Lions

Skull measurements taken from hunter killed lions included skull length and skull width. A total of 195 skull lengths and 183 skull widths were measured to examine skull growth in Montana mountain lions (Figures 1 and 2).

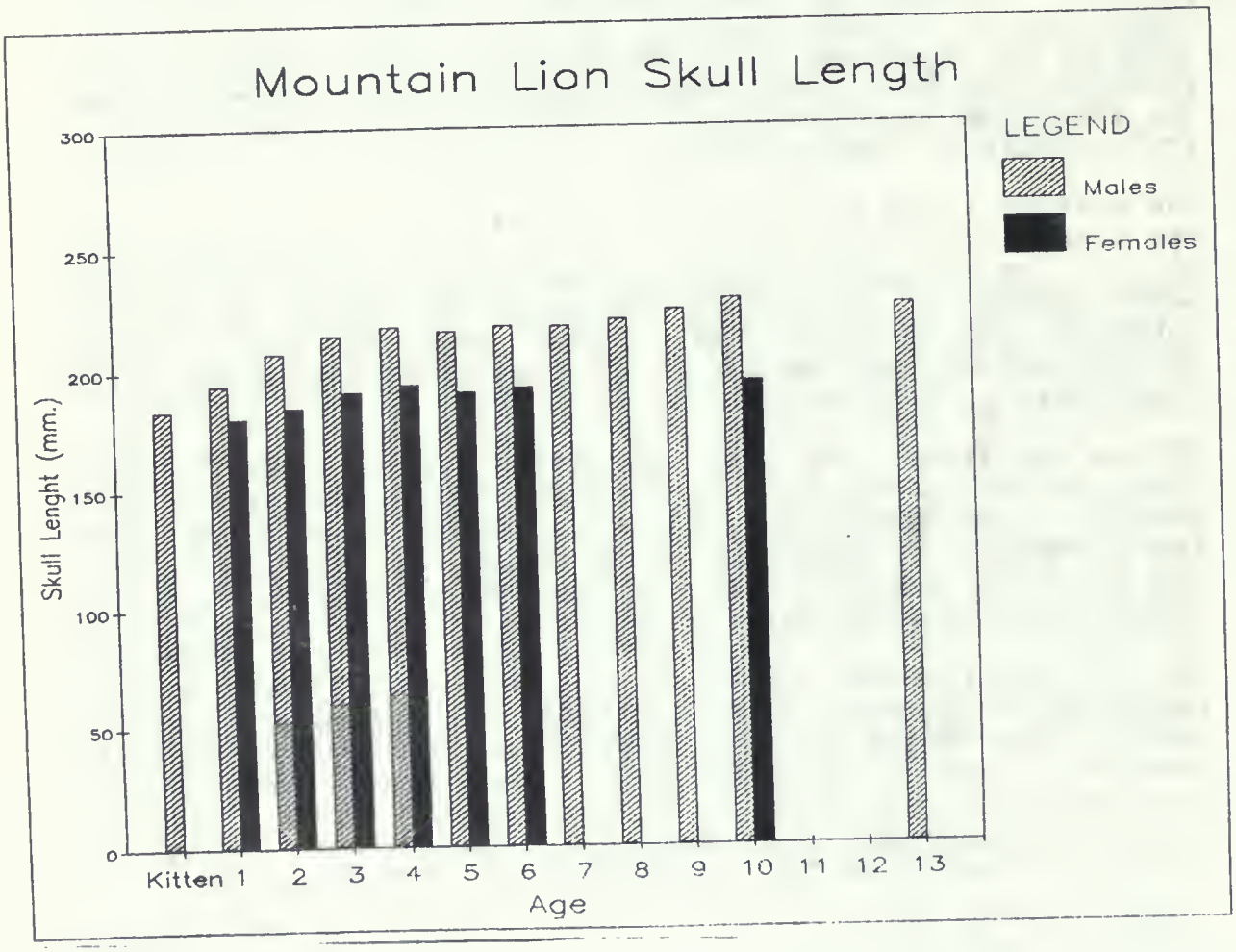

Figure 1. Length of mountain lion skulls by age class.

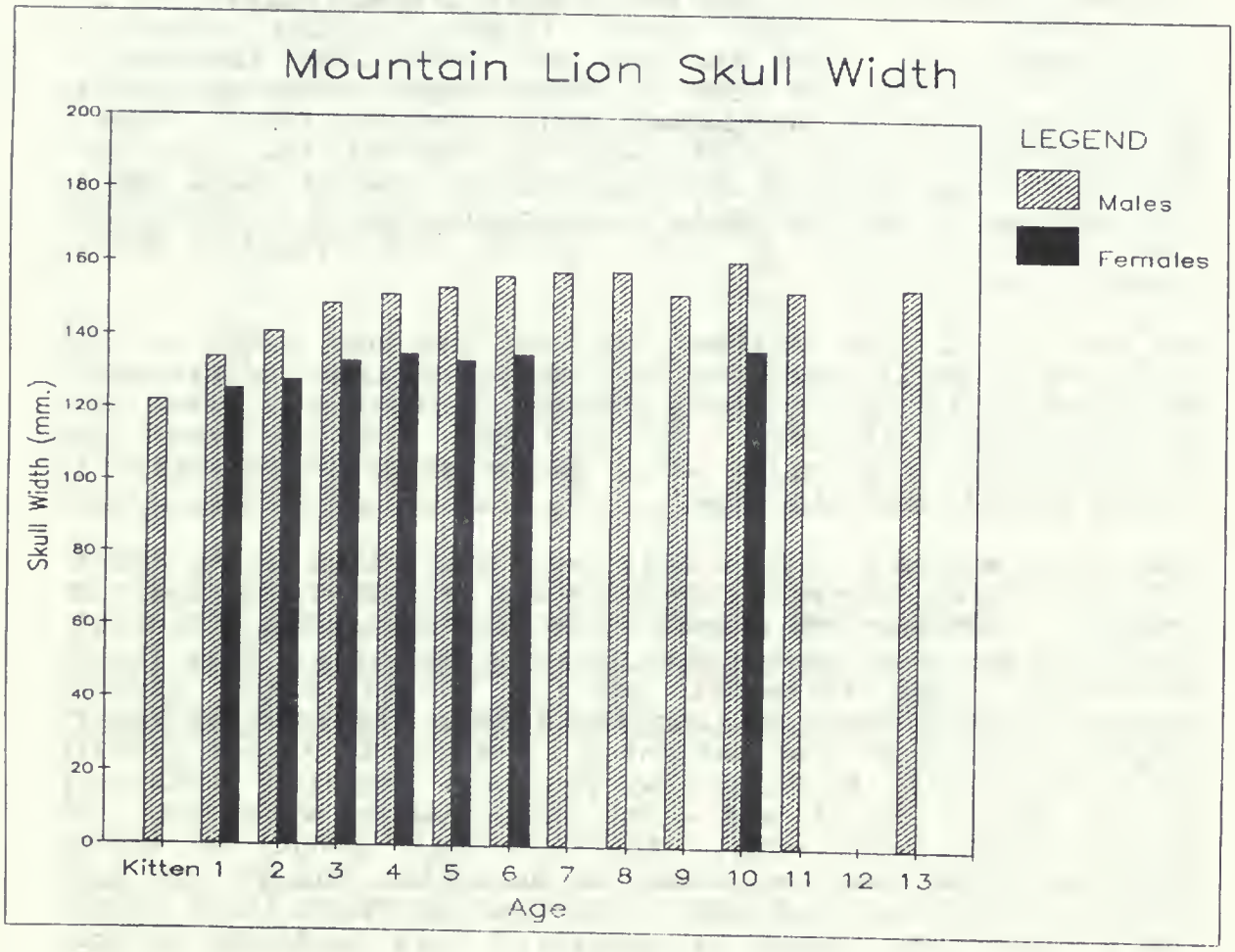

Figure 2. Width of mountain lion skulls by age class.

Average skull width for females was 130.6 mm., and average skull length was 187.4 mm. The average width and length of male skulls were 148.1 mm and 213.0 mm. Female skulls increased in width and length until age 4. Male skulls increased in length until about age 4 but continued to increase in width until age 6 or 7. Further measurements will be made in future samples to increase the sample size.

Age and Sex Determinations of Montana Mountain Lions

Power (1988) reported that canine diameter and skull length were reliable indicators of sex. From 167 lions examined during the hunting season 1989-90, canine diameter was

measured to determine if sex had been accurately determined in the field. In eight cases (4.8%), canine diameter measurements indicated the sex may have been improperly classed. However, in five of these eight cases the skull length supported the sex determination from the field. Thus, in only three cases (1.8%) was the sex of the specimen contraindicated by skull characteristics. Two of these cases were females which had skull characteristics of a male, and one case involved a male which had female skull characteristics.

The results of these reviews indicate that most lions in the field are properly sexed and that few if any cases of mistaken sex occur to affect the quota system for females in place for many hunting districts. In addition, the sex could be properly identified using skull characteristics to verify a female kill in a quota area.

Ages from mountain lion skulls were determined using three methods. First, the premolar tooth was extracted for cementum analysis. Trainer and Matson (1988) discussed the potential for aging mountain lions using cementum analysis. They found relatively good agreement between paired blind tests. However, few known-aged lion teeth were examined in their sample. Ages were also estimated according to Ashman (1983) and Power (1988) by examining wear and eruption patterns. Lastly, skull length and width measurements were made to support other aging data. Aberrant skull length or width characteristics were examined to determine the proper age assignment for the specimen. Several mountain lions where the premolar was absent or destroyed were assigned an age based on wear and skull characteristics.

In 1988-90, 304 premolar teeth from lions were aged by cementum analysis. A comparison between age estimate and cementum age was made for lions aged using both techniques (Table 3). Agreement was relatively good for lions aged less than 4 years old between the estimated age and tooth cementum age. However, as ages of lions increased, the age estimate and cementum age disagreed considerably. Age determinations by wear pattern tended to overestimate age for lions 4 years or less in age and underestimate age for lions older than 4 years of age.

Cementum analysis allows for a certainty code to be assigned with each age. In 1988-90, the distribution of certainty codes was examined to determine how often cementum ages were considered accurate by Matson's laboratory (Table 4). Eighty-three percent of the teeth aged were classed as an A or B certainty code.

Table 3. Distribution of the difference in years between age estimates and cementum annuli counts of mountain lions, 1988-90.

Est. Age	N	Disagreement in Years								
		-4 and >	-3	-2	-1	0	1	2	3	4+
1	40	0	0	0	3	16	11	8	2	0
2	88	0	0	0	20	42	12	9	4	1
3	85	0	0	4	20	39	11	6	0	5
4	46	0	0	4	12	17	8	1	4	0
5	32	1	5	16	2	8	0	0	0	0
6	15	1	8	1	2	0	3	0	0	0
7-9	20	5	3	2	1	8	0	1	0	0
10+	6	6	0	0	0	0	0	0	0	0

Table 4. Distribution of certainty codes for mountain lion premolars aged by cementum annuli counts, 1988-90.

Certainty Code	Frequency	Percent
A	65	18.7
B	223	64.3
C	16	4.6
*D	43	12.4

* D code indicates an age assigned at the laboratory using other methods.

Forty-three skulls were assigned an age because the premolar tooth was absent, lost, or destroyed. The assigned ages were derived from skull characteristics and wear patterns (Ashman 1983). Skull characteristics and age estimates resulted in reassignment of four cementum annuli counts for mountain lions aged 3 or less.

Estimating age by tooth wear appeared too subjective to accurately assign ages to mountain lions. Errors were very large in old aged lions, and the technique did not allow for variances in the interpretation of wear pattern by different observers. It is recommended for consistency that cementum analysis supported by skull characteristics identified by Greer (unpublished data) be used to determine the age of mountain lions.

Total Mortality Records, 1988-90

The total lion mortalities recorded for 1988-89 and 1989-90 were 163 and 191, respectively. The number of recorded non-hunting mortalities increased from 4 in 1988-89 to 24 in 1989-90 (Table 5).

Table 5. Total mortalities by class of mortality, 1988-89 and 1989-90.

Mortality Class	No. of Lions		Percent	
	1988-89	1989-90	1988-89	1989-90
Accidental Snare	2	3	1.2	1.6
Animal Damage Control	0	3	0.0	1.6
Nuisance Control	0	3	0.0	1.6
Illegal	0	2	0.0	1.1
Dogs	1	0	0.6	0.0
Road Kill	1	3	0.6	1.6
Self Defense	0	5	0.0	2.6
Train	0	1	0.0	0.5
Natural	0	2	0.0	1.1
Unknown	0	2	0.0	1.1
Subtotal	4	24	2.4	12.7
Hunting				
Archery	30	38	18.4	19.9
Handgun	69	71	42.3	37.2
Rifle	60	57	36.8	29.8
Unknown	0	1	0.0	0.5
Subtotal	159	167	97.6	87.3
TOTAL	163	191	100.0	100.0

Most of the increase in mortalities during 1989-90 as compared to 1988-89 was due to nonhunting mortalities and possibly more accurate record keeping of the nonhunting mortalities. Self defense cases, animal damage control, and nuisance situations added a significant number of mortalities during the recent reporting period.

The mean age of all mortalities in 1988-89 and 1989-90 was 3.11 and 3.59. A two sample t-test revealed that the mean age was significantly higher in 1989-90 ($P<0.05$). The median age of lions was 3 years for both years.

Most of the increase in mortalities came from Regions 1 and 2 (Table 6). Mortalities in Regions 3, 4, and 5 did not change significantly between years. Regions 1 and 2 accounted for 62.6% of the 1988-89 mortalities and 69.6% of the 1989-90 mortalities.

Table 6. Lion mortalities by MDFWP Regions, 1988-89 and 89-90.

	1988-89		1989-90	
Region	Hunting	Nonhunting	Hunting	Nonhunting
1	50	1	65	10
2	50	1	49	9
3	18	2	18	2
4	23	0	21	2
5	18	0	12	2
7	0	0	1	0

Mountain Lion Harvest Sex and Age Structure 1988-1990

Hunting mortalities were 159 and 167 in 1988-89 and 1989-90 respectively. The harvest trend since 1983 has increased slightly but not significantly ($P<0.05$, Fig. 3). The sex ratio of the harvest was very similar for both seasons 1988-89 and 1989-90 (Table 7).

Table 7. Sex ratios of harvested mountain lions 1988-1990.

Sex	Frequency		Percent	
	1988-89	1989-90	1988-89	1989-90
Males	111	121	70.3	72.9
Females	47	45	29.7	27.1

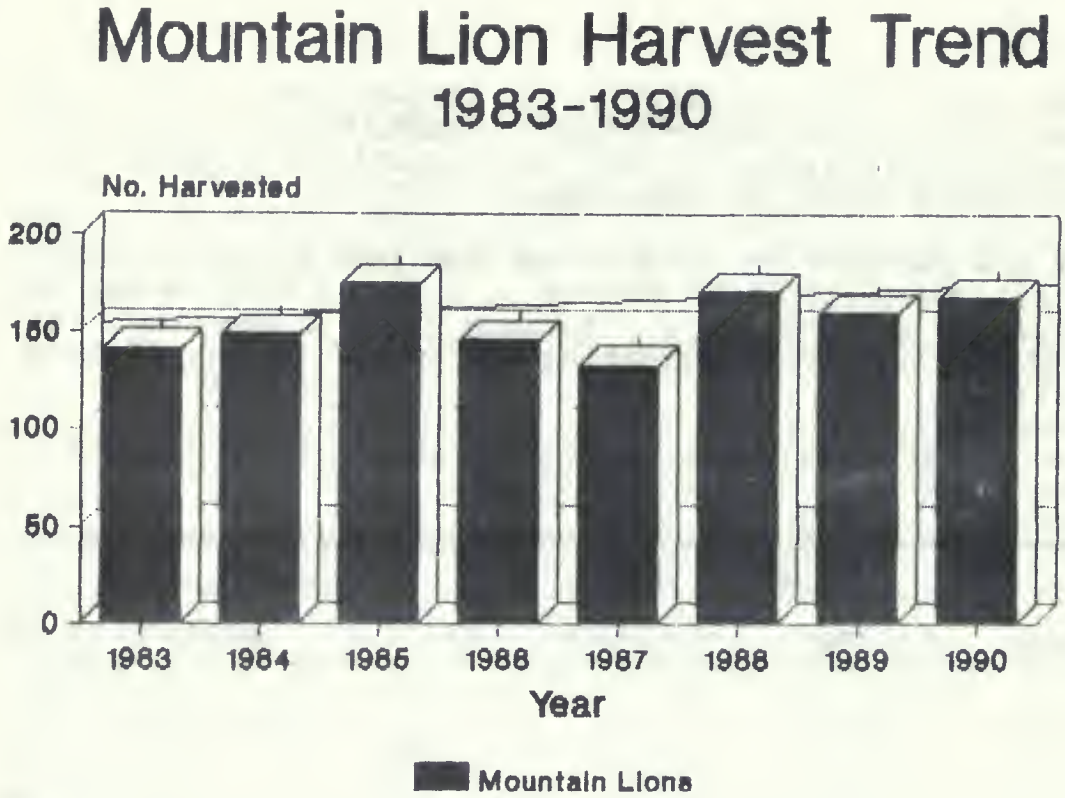

Figure 3. Mountain lion harvest trend, 1983-1990.

Harvest statistics were summarized by hunting district (Table 8). Lions were harvested in each of five regions in 1988-89 and six regions in 1989-90. There was one lion harvested in Region 7 in 1989-90. Lion harvests were similar between each year for all regions except regions 1 and 5. Lion harvests increased in Region 1 from 50 to 65 or 30.0%. Lion harvests decreased from 18 to 12 in Region 5 or 33.3%.

The age structure of the statewide harvest increased slightly from 1988-89 to 1989-90. The mean age of harvested lions rose from 3.1 to 3.7 years. A two sample t-test revealed that the slight increase in age structure was significant between the years ($P<0.05$, $t=2.9$, 319 d.f.) (Figure 4). The median age of harvested lions was 3 years of age for both years.

Summary of Mountain Lion Incidents in Montana

During the period from July 1989 until August 1990 the interactions of mountain lions and humans were monitored. Records of interactions were compiled from regional newspaper articles, MDFWP written case reports, USFWS Disposition Reports, and necropsy reports from the MDFWP wildlife laboratory. A total of 37 incidents confirmed by wildlife officials were recorded throughout the State of Montana. These reports do not represent incidental sightings near homes

Table 8. Mountain lion harvest by hunting districts, 1988-89 and 1989-90.

Hunting District	1989	1990	Total
100	5	11	16
101	4	6	10
102	1	4	5
103	9	1	10
110	3	6	9
120	1	4	5
121	9	10	19
122	1	5	6
123	5	6	11
130	9	9	18
140	2	1	3
141	0	1	1
150	1	0	1
170	0	1	1
200	1	1	2
201	4	6	10
202	7	10	17
203	6	1	7
204	0	5	5
210	3	2	5
212	2	0	2
215	0	1	1
216	2	2	4
240	6	2	8
250	7	8	15
270	1	1	2
281	2	3	5
283	3	2	5
285	2	1	3
291	1	1	2
292	1	2	3
293	2	1	3

Table 8 continued.

Hunting District	1989	1990	Total
300	2	0	2
301	1	2	3
302	1	3	4
312	1	0	1
313	2	1	3
314	2	1	3
317	1	2	3
320	1	0	1
322	0	1	1
330	1	0	1
331	1	0	1
360	2	3	5
362	1	0	1
390	1	0	1
392	1	4	5
393	0	1	1
410	1	0	1
411	1	0	1
412	0	1	1
413	2	0	2
414	2	0	2
416	2	1	3
422	1	2	3
424	4	0	4
427	1	0	1
429	0	2	2
432	0	4	4
441	3	4	7
442	3	2	5
443	1	0	1
448	0	3	3
449	1	0	1
454	1	2	3
511	1	0	1
520	6	4	10
530	2	0	2
540	1	2	3
560	6	5	11
575	1	1	2
590	1	0	1
704	0	1	1

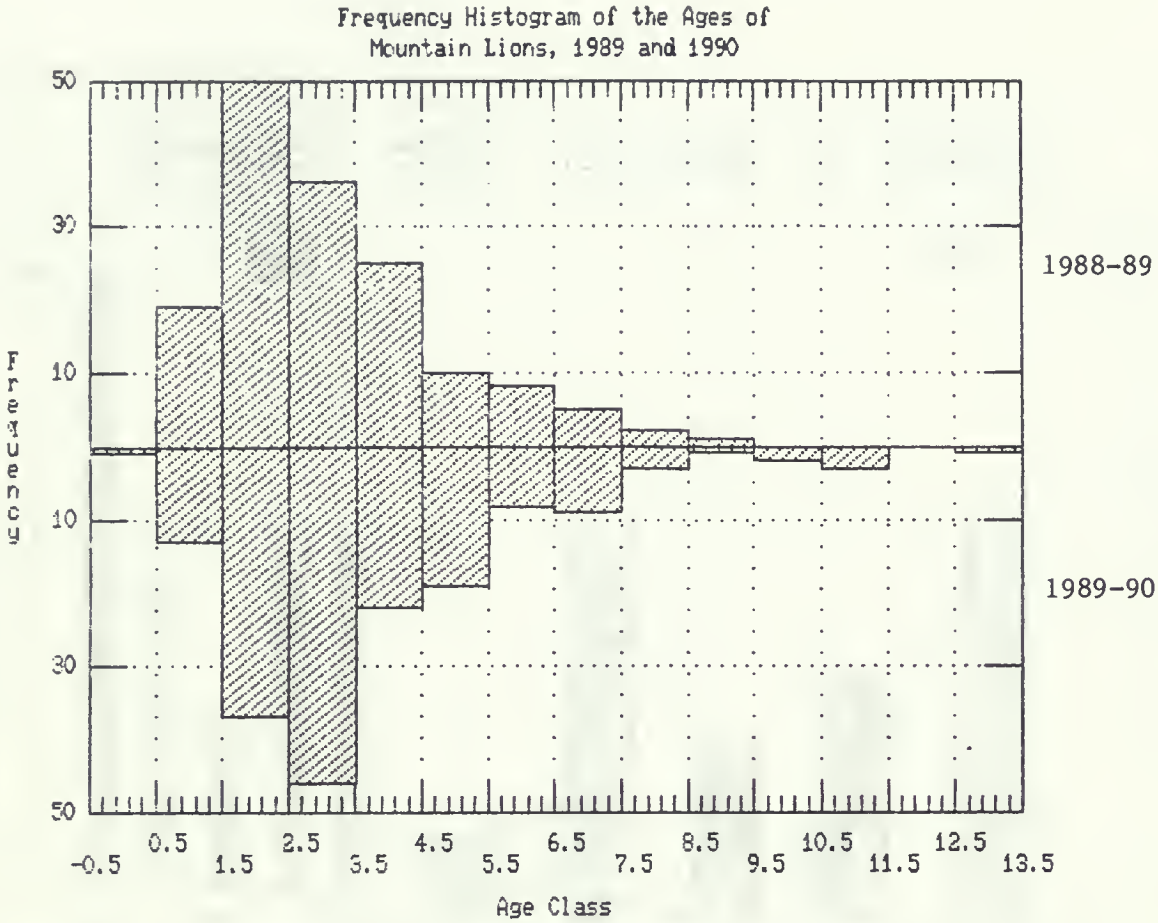

Figure 4. Age structure of the mountain lion harvest, 1988-89 and 1989-90.

or communities. Other reports were received by phone or written correspondence but could not be confirmed by official reports.

Actions of the lions were classified as involving livestock attacks, pet attacks, nuisance situations, predatory/ aggressive behavior toward humans, and human attacks. All human attacks required actual contact with the human and resulting injuries inflicted by the cat on humans. Predatory/ aggressive behavior exhibited toward humans involved charges and sneak approaches toward humans, clawing the air, and vocalizations. In all aggressive exhibits, no actual contact is made with the human involved. Nuisance situations involved lions frequently seen near homes, ranches, or communities.

Twelve (32.3%) of the 37 incidents reported in this period were classified as livestock attacks (Figure 5). Lions were captured and killed in 5 (41.6%) of these livestock cases. Ten of the cases (83.3 %) involved sheep. Other reported incidents of mountain lion interactions with livestock included poultry, cattle, and horses. Livestock cases occurred throughout the May-October period.

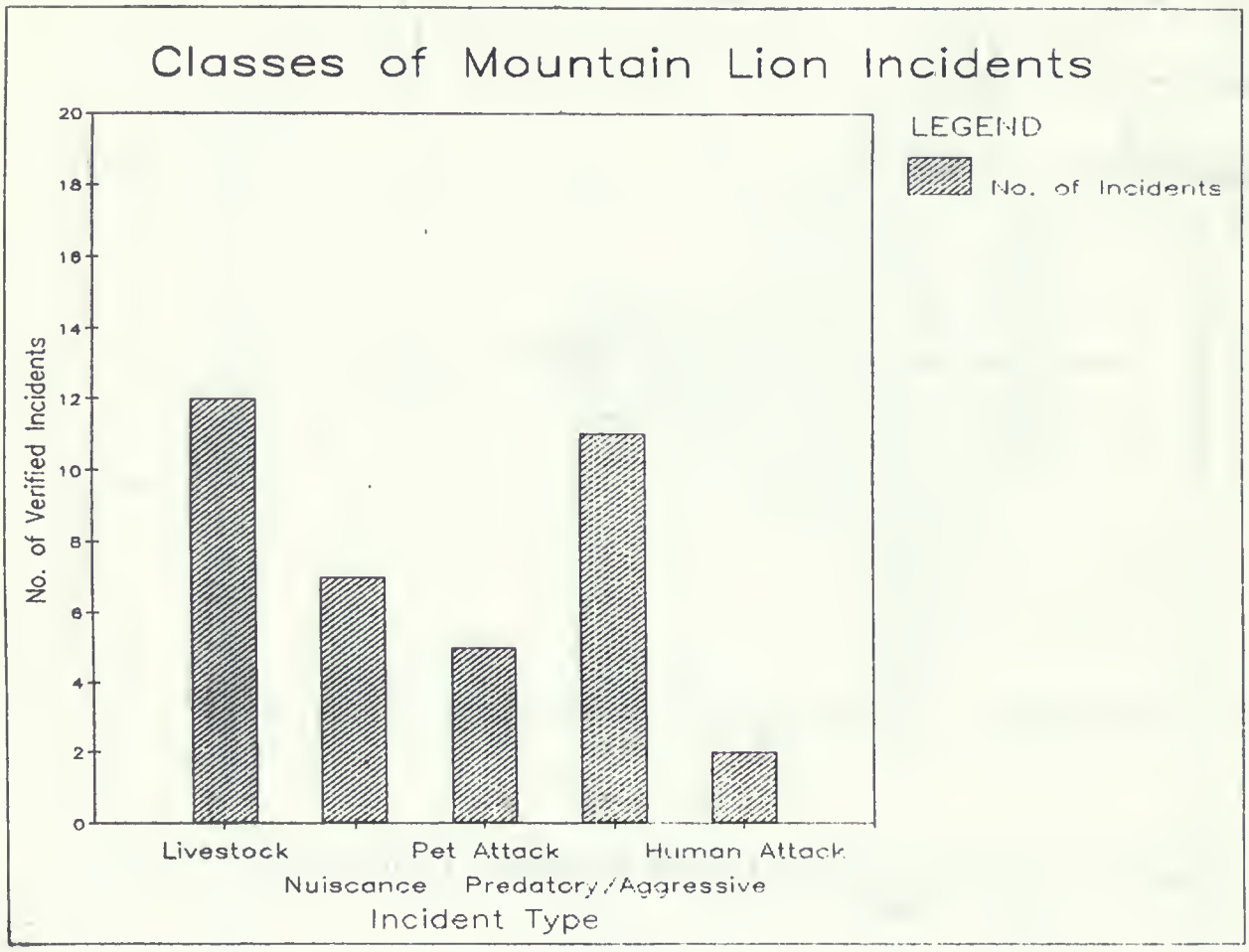

Figure 5. Frequency of mountain lion incidents by class in Montana, 1989-90.

The interactions of livestock and mountain lions is not unusual in Montana, and all cases reported were excluded from the following human incidence analysis. Thus, 25 cases not involving livestock were investigated and analyzed further to define the parameters of lion/human interaction.

Lion/human interaction was reported in all months except March, April, and May (Figure 6). Most of the cases (84.0%) were during the months of July-November. This is possibly a time period when 12-24 month old mountain lions are becoming more independent of their mothers. This is also the time when humans are most active within the habitat of mountain lions. The fall incidents involved close encounters with lions and sport hunters, while the spring/summer encounters were with recreationists and residents within mountain lion habitat.

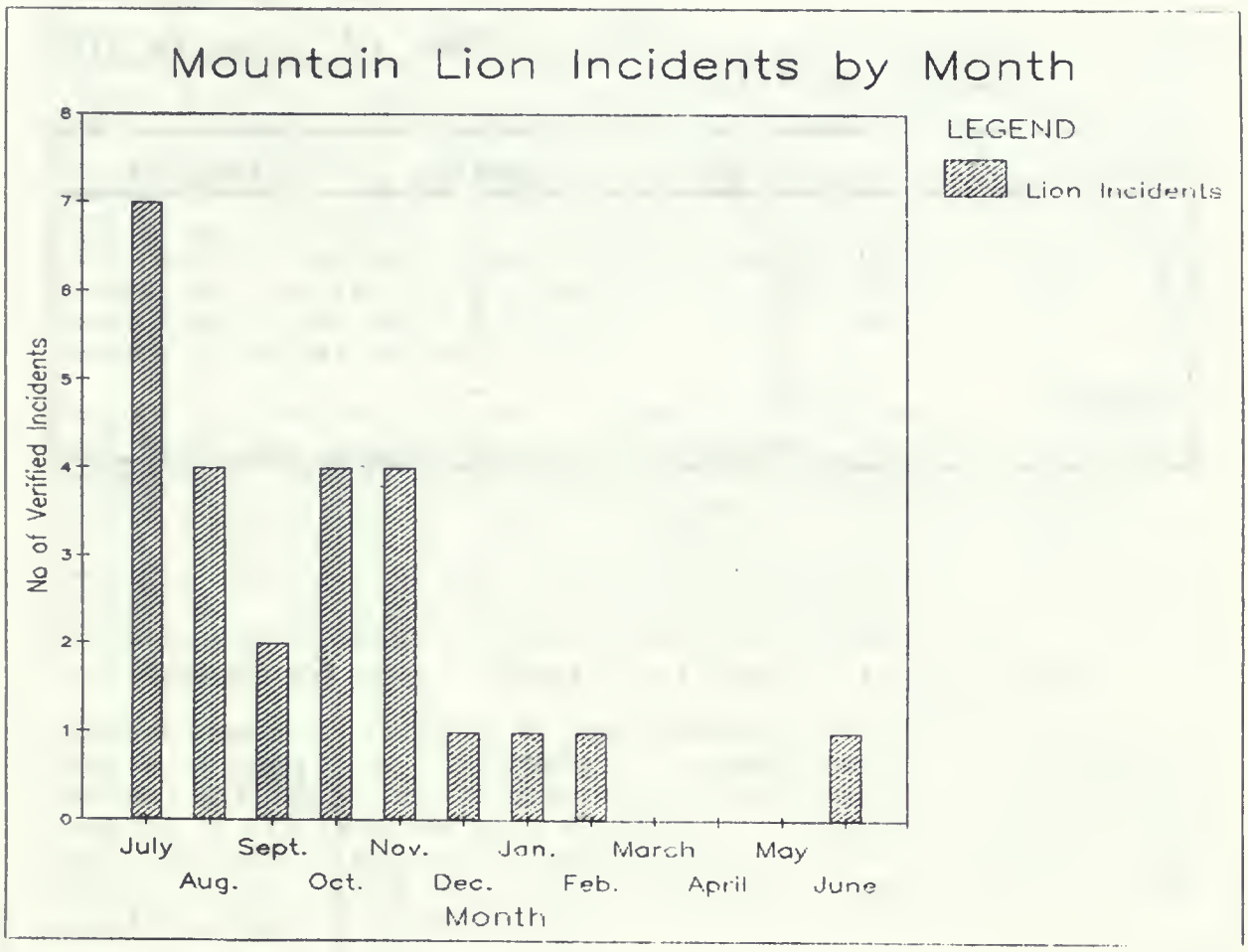

Figure 6. Frequency of mountain lion incidents by month, 1988-90.

Ages were recorded for 15 of the 25 lions involved in the reported incidents (Table 9). Eighty percent of the lions were aged at 2 years or less suggesting that most of the problems were dispersing subadult lions. Sex was determined for 16 lions involved in the cases reported. Eight of the lions were female and eight were male indicating that sexes were equally involved in the cases.

Lion incidents were reported in five regions within the state of Montana (Figure 7). Seventy-six percent of the incidents were reported from Regions 1 and 2. This observation is consistent with lion distribution and density information within the State of Montana. Lion mortality data from 1988-90 indicates that 66.4% of the lion mortalities in the state occur in Regions 1 and 2.

Table 9. Age and sex of lions involved in incidents with humans, 1989-90.

Age	No. of Lions	Males	Females
Kitten	1	0	1
1	5	3	2
2	6	3	3
3	2	2	0
4+	1	0	1
Unknown	10	-	1
Total	25	8	8

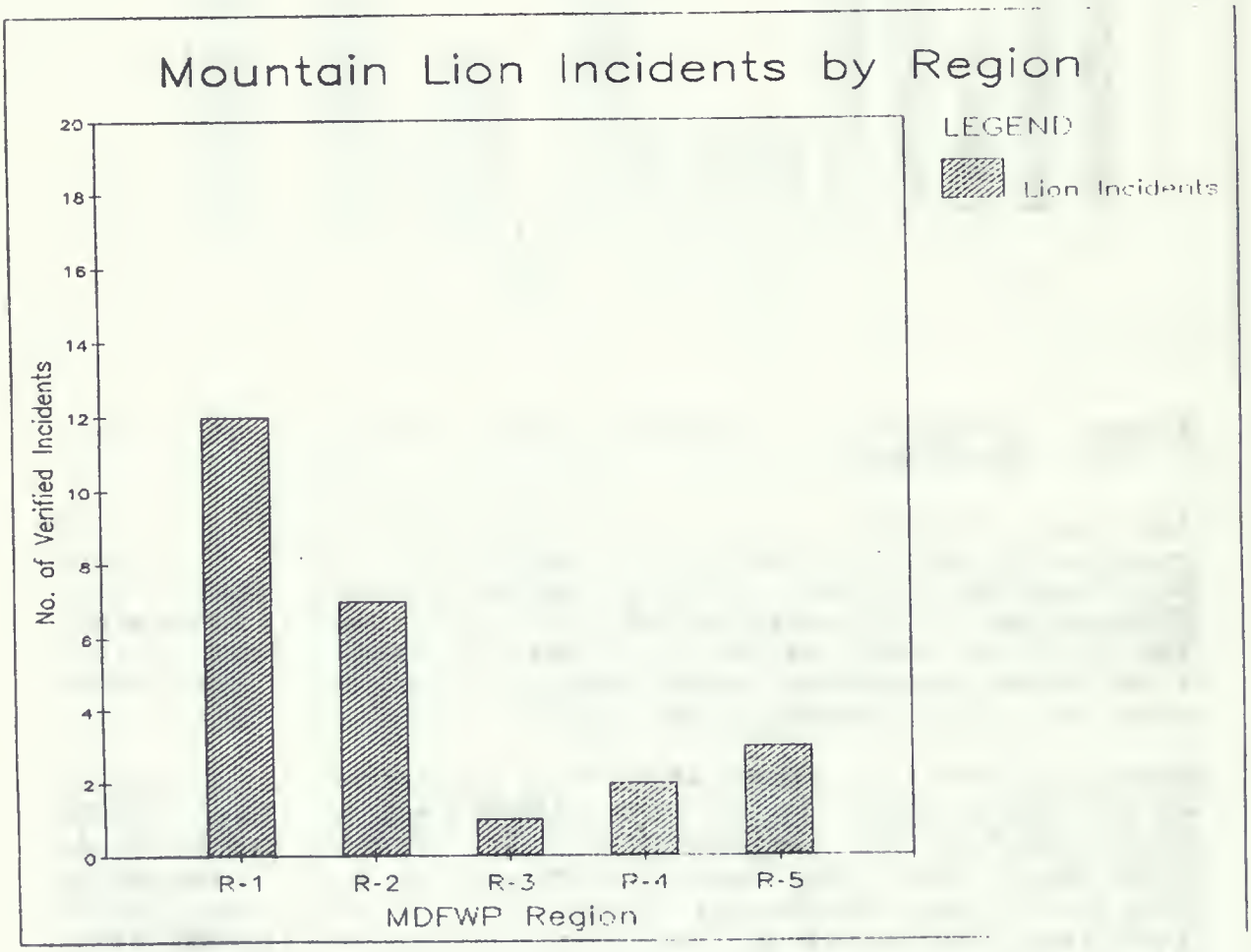

Figure 7. Frequency of mountain lion incidents by FWP region, 1989-90.

Thirteen (52.0%) cases reported a perceived or real predation/aggression behavior exhibited by mountain lions toward humans (Figure 3). Two actual attacks were reported with one injury and one death recorded. Both attacks involved children, however several other reported interactions involved adults as well. Pets were at the scene, the subject of the attack, or had been previously fed upon in 7 of the 25 cases. Five cases of predatory/aggressive behavior between humans and lions involved fall big game hunters. In all of these later cases, the lion was killed or severely wounded because of a perceived threat to the hunter.

Twelve of the lion/human incidents resulted in carcasses available for examination and necropsy. Only two of the necropsied lions (16.6%) appeared nutritionally stressed or showed indications of health problems. Both lions judged to be in poor condition were involved in nuisance situations. Each was one year of age and mildly infested with intestinal parasites. None of the carcasses from lions involved in predatory/aggressive interactions were judged to be in poor condition.

Disease was not detected in the examination of various tissues either grossly or through histopathological techniques. Feline distemper or rabies are ruled out as significant factors in the interactions observed. Veterinary pathologists indicate that either of these diseases would result in a very unhealthy or dead lion by the time the disease would significantly alter behavior.

Parasite loads were normal in most lions examined. Three lions had somewhat high infestations of tapeworms. These include the two aforementioned lions in poor condition.

The stomach contents of all necropsied lions were examined. Contents were composed of two types of food including anthropogenic foods (to include human pets) and natural foods (deer and elk). In four cases, the stomach was empty. The remaining eight stomachs examined included anthropogenic foods in five and natural foods in three. Anthropogenic foods identified included domestic cats, domestic dogs, cloth, and upholstery. In both cases involving human attacks, the lions were feeding upon anthropogenic foods before the actual attack occurred, and in at least one predatory/aggressive human encounter, the lion involved had previously fed upon a domestic cat.

The recent increase of mountain lion/human interactions in Montana probably has resulted from several interacting factors. The lions involved have included mostly sub-adult cats, and the timing of the interactions is specific to a period when the young lions may be dispersing, indicating that

an increase in population is probably playing the major role. Once young cats disperse to locate and establish territories, they interact with humans along the fringes of less developed habitat. This interaction may begin a gradual habituation to humans followed in some cases by food conditioning and the ultimate loss of any fear of humans. This situation is not a unique phenomenon and has occurred in British Columbia (Lay 1976) and California (Fitzhugh 1988).

These lions are often taking advantage of human food resources and in particular begin to prey upon livestock, human refuse or natural prey near communities or campgrounds and in some cases pets in residential areas. This shift in feeding strategies may ultimately result in experimentation with humans as a potential prey species. So far in Montana, lions attacked humans following previous associations with men or pets rather than by spontaneous predatory behavior.

Pets of humans, in particular dogs and cats, are commonly involved in the equation. In several instances in Montana, these pets became a prey base for lions frequenting residential areas. In other cases, pets were accompanying the humans involved in charges and may have been the actual target of the predatory behavior.

Sportsman afield during the big game hunting season are also a significant source of interaction with mountain lions in Montana. In any year, several self defense kills are reported to the MDFWP as a result of this interaction. With the heightening perceptions of mountain lions as a human threat, we can expect self defense mortalities to increase following the media attention given the recent encounters.

Recommendations to Lion Managers

Previous studies of human attacks have indicated one significant problem in analysis of the data (Fitzhugh 1988). In most cases, the reports were inadequate and difficult to compile. We are recommending a standard reporting policy for these human/lion interactions. This should not necessarily include all reported sightings but certainly field verified accounts of interactions between humans and lions. Compiling the information and watching the trend of the data could be essential information to support decisions. Included in each incident report should be a field case report and a laboratory necropsy report. Also news clippings should be copied.

Carcasses should be examined when possible to continue to monitor the role disease or parasites could play in this scenario. The results of our necropsies were important in ruling out the health factor as a causative agent in the

human/lion interactions we have experienced thus far. Previous studies suggest that poor health is a significant factor (Sanders 1977, Dewar and Dewar 1976) while others indicate that health of the lions involved was generally good (Spalding 1971).

We should inform people living or recreating within lion habitat to closely monitor their pets and report any unusual pet mortalities which may be a result of lion predation. In addition, very small pets should be kept inside overnight. Attractants should be controlled very carefully in campsites, yards, and porches to avoid food conditioning.

Montana sportsmen entering the field this fall should be informed regarding lion behavior and information to counteract the perceptions developed by lion activities this summer. Such information would be helpful in curbing any sudden and unnecessary increase in self defense situations this hunting season.

Animal Immobilizations

Immobilizing drug needs were solicited from FWP personnel statewide. Phencyclidine HCL, Ketamine, and Rompun were freeze dried, weighed, and bottled for distribution. Telazol, dopram, and acepromazine were ordered and distributed. A computer database was developed to log all drugs distributed to field personnel. Dose charts were developed for field use and distributed with the drugs along with current literature on the use of various animal immobilants. A generic field form to record animal immobilizations was developed for record keeping by field personnel. Animal immobilization performance reports were solicited to review success and efficiency of using various drugs in field situations.

FDA rules and regulations regarding drugs used in animals consumed for food were reviewed. Recommendations were made to improve compliance. Contacts were made with various experts to solicit opinions on FDA rules. The wildlife laboratory DEA permit was updated to reflect the use of both Schedule II and Schedule III drugs now being used during animal immobilizations.

A short training workshop was held in R-5 to upgrade personnel on the use of the drug Telazol in bears and lions. A short program on drugs was presented at the statewide enforcement meeting at Fairmont Hot Springs. Video footage was compiled on bear handling techniques for development of a field techniques video. Consulting was provided to FWP personnel during various immobilization situations throughout the state.

Bison

The four bison taken by Montana hunters during the report period included an adult male taken near Gardiner, and a yearling bull and two adult cows taken near West Yellowstone. Blood samples for brucellosis testing were obtained from all animals (see section on disease investigations). Standard measurements and incisor teeth for aging were taken. This data will be reported at a later date after analysis is complete.

Animal Necropsies

A total of 41 specimens representing 13 species of birds and mammals were necropsied to determine the cause of death or to identify tissues, parasites, or abnormalities (Table 10). Several eagles were submitted to the National Wildlife Health Research Laboratory for necropsy or other testing. Necropsy reports were filed and distributed to requestors.

Table 10. Species and frequencies of wildlife specimens submitted for necropsy during FY 90.

Necropsy Type/Species	Frequency	Percent
Edible Meat	6	14.6
Muskrat	1	2.4
Bighorn Sheep	3	7.3
Elk (fetus)	1	2.4
Mule Deer	1	2.4
Mountain Lion	6	14.6
Grizzly Bear	3	7.3
Wolf	3	7.3
Coyote	6	14.6
Pine Marten	4	9.8
Mallard Duck	1	2.4
Pheasant	1	2.4
Eagle	3	7.3
Pelican	2	4.9

Duck Wing/Pesticide Studies

Duck wings were again obtained from flyway "wing bees" and cooperating hunters. They remain in cold storage pending receipt of potential funding for analysis.

Results of organochlorine pesticide analysis of wings collected from the fall of 1988 are reported by Weigand and Schladweiler (1989).

Annual Trophy Sale

The annual trophy sale was conducted in April. There were 96 items for sale including hides, capes, skulls, claws, and antlers from nine species of mammals. Parts from bighorn sheep, black bear, and mountain lion were the most common sale items. Gross sale proceeds were $14,908. A total of 48 bidders from throughout the U.S. and Canada were registered at the sale.

Educational Materials

The wildlife mounts and reference specimens available for the local wildlife educational programs were inventoried and moved to storage cases above the laboratory. Specimens were checked out by educators routinely during the report period.

Fifty-eight requests for specimens from our hide and skeletal reference collections were received during the year. Forty-three requests were filled, and four were partially filled. A total of 36 tanned hides and 21 green hides were distributed to various institutions, agencies, and museums throughout the U. S. In addition, over 100 skulls from various mammals were distributed to requestors. Requests for jawboards, skeletons, bear claws, antlers, and elk teeth were also filled.

Biotelemetry Frequency Coordination

In 1989, all known users of wildlife biotelemetry in the State of Montana provided information on wildlife transmitters they operated in various programs. The data from this census was entered into a computer in 1990. A survey was conducted in July 1990 to update the information on the computer database. As a result of these surveys, over 2200 radio frequencies were in the database after July 1990. Frequencies ranged from 148.000 to 171.000 for wildlife telemetry devices. The most commonly used range was 150.000 to 152.000 (Table 11).

Approximately 1200 of the listed telemetry devices were operating on wildlife through the report period. The remainder were on order, stored on shelves, or being rebuilt. Telemetry devices operated on 19 species of wildlife (Table 12). Elk, mule deer, white-tailed deer, moose and grizzly bears were the most common species radio collared.

Table 11. Distribution of radio frequencies used on wildlife telemetry devices, 1989-90.

Frequency Range	No. Transmitters	Percent
148.000-149.000	92	4.1
150.000-151.000	732	33.1
151.000-152.000	861	38.9
152.000-153.000	103	4.7
164.000-165.000	230	10.4
165.000-166.000	179	8.1
166.000-168.000	14	0.6
171.000-172.000	1	0.1
	2,212	100.0

Table 12. Biotelemetry devices ordered and operating on wildlife species in and near Montana, 1990.

Species	No. Devices	Percent
Elk	861	43.8
Deer (WT and MD)	424	21.6
Moose	53	2.7
Grizzly Bears	314	16.0
Black Bears	21	1.1
River Otter	6	0.3
Bald Eagle	19	0.9
Mountain Goat	6	0.3
Bighorn Sheep	22	1.1
Wolf	34	1.7
Golden Eagle	3	0.1
Caribou	28	1.4
Fisher	36	1.8
Sharptailed Grouse	45	2.3
Turkeys	71	3.6
Boreal Owl	2	0.1
Sage Grouse	7	0.3
Hawks	12	0.6
Mountain Lion	3	0.1
Total	1,967	100.0

Table 13 displays the frequency and percent of radio telemetry activity by various wildlife organizations. The Montana Dept. of Fish, Wildlife and Parks was the agency most commonly employing biotelemetry in their programs.

Table 13. The number of biotelemetry devices used in various wildlife programs throughout and near the State of Montana, 1990.

Wildlife Agency	No. of Devices	Percent
The Blackfoot Nation	13	0.6
U. S. Forest Service *	20	0.9
Mont. Dept. FWP	1492	67.5
U.S. Fish and Wildlife Serv.	107	4.8
Glacier Natl. Park	25	1.1
Idaho Fish and Game	45	2.0
Interagency Grizzly Study	120	5.4
Montana State University	126	5.7
University of Montana	218	9.9
University of British Col.	20	0.9
Wildlife Wildlands Inst.	5	0.2
Other	21	10.0

* Includes radio frequency for hand radios.

An FCC coordination committee meeting was attended. Frequency coordination was conducted through this meeting and the exchange of data base information to assure limited interference with other licensed radio operations in Montana.

Parasites of Wildlife

Trichinella tests were completed on 61 black bears, most of which were submitted by hunters, and 24 mountain lions, 3 wolves, 4 grizzly bears, and single samples of lynx, bobcat, and wolverine. Nine black bears (15%) were positive at 0.4 to 141.2 larvae per gram (LPG). The only other positive animals included 1 wolf (8.0 LPG) and 1 wolverine (0.5 LPG). Trichinella tests are pending on approximately 125 additional samples, mostly from hunter-killed mountain lions.

Helminth parasites were found in the gastrointestinal tracts of all mountain lions examined (n=5), one wolf, and one bighorn sheep examined. Lungworms were also present in the bighorn sheep examined. The spinose ear tick, bot larvae, and Trichuris spp. were found in mule deer submitted for examinations. Mountain lion specimens were found to host Cestodes, Taenia spp., Toxascaris, Ollulanus tricuspis, and Physaloptera preputalis. The wolf specimen was found to host Echinococcus granulosus, Cestodes, and Taenia pisiformis.

Diseases of Wildlife

The Montana Veterinary Diagnostic Laboratory tested 880 individuals of 32 species (20 wildlife and 12 domestic

livestock or pets) for rabies during the report period. Positive test results were obtained from 3 of 80 cattle, 1 of 5 horses, 1 of 14 domestic sheep, 9 of 117 bats, and 38 of 104 skunks. All other remaining individuals from 27 species tested negative for rabies.

Specific groups of animals with abnormal behavior were tested for incidence of rabies this year. Five coyotes engaging in abnormal behavior and human attacks in Yellowstone Park failed to show positive tests for rabies. Eight mountain lions involved in altercations with mankind were tested for rabies and all were found negative.

Blood serum samples from several species of wildlife were tested by the Diagnostic Laboratory for the presence of antibodies against various diseases. Most samples submitted by FWP personnel were routinely tested for anaplasmosis, bluetongue, brucellosis, and leptospirosis. Additional diseases tested for in some of these samples included infectious bovine rhinotracheitis (IBR), bovine virus diarrhea (BVD), and parainfluenza 3 (PI-3). Results from these additional tests will provide baseline data for comparison with data collected in subsequent years.

Wildlife samples tested for anaplasmosis included 274 elk, 51 mule deer, 139 white-tailed deer, 28 moose, and 58 bighorn sheep. With the exception of one elk which gave a suspect reaction, all anaplasmosis tests were negative.

Bluetongue was diagnosed in 1 of 274 elk and 5 of 51 mule deer. All other animals tested (139 white-tailed deer, 28 moose, and 64 bighorn sheep) negative for bluetongue antibodies.

Samples tested for brucellosis included 274 elk, 52 mule deer, 139 white-tailed deer, 28 moose, 64 bighorn sheep, 13 black bear, 4 bison, and 1 wolf. A lone yearling bull bison taken by a hunter near West Yellowstone gave a suspect brucellosis reaction; all other test results were negative.

Positive leptospirosis tests included 80 of 274 elk, 1 of 52 mule deer, 10 of 139 white-tailed deer, 3 of 28 moose, 25 of 64 bighorn sheep and 6 of 13 black bear. The single wolf tested for this disease was negative.

Wildlife which tested positive for IBR included 57 of 215 elk, 27 of 138 white-tailed deer, and 10 of 24 mule deer. All bighorn sheep tested (n=64) were negative.

A high proportion of animals tested for BVD were positive including 159 of 208 elk, 63 of 64 bighorn sheep, 10 of 22 mule deer, and 66 of 138 white-tailed deer.

Animals testing positive for PI-3 included 75 of 181 elk, 46 of 63 bighorn sheep, 9 of 23 mule deer, and 35 of 134 white-tailed deer.

In addition to the disease tests noted above, 1 coyote and 2 wolves were tested for canine parvovirus, and 1 coyote and 1 wolf were tested for canine distemper. One coyote was diagnosed with distemper; the remaining tests were negative.

Wolf Mortality Records

No formal wolf mortality recording process exists in Montana to date. A short summary of wolf mortalities as received by our laboratory was developed to begin formalizing a process. Old records were examined in the laboratory files to determine when and where wolves were killed in Montana in recent history (Table 14). At this time, the list is fairly complete but may be missing records of mortalities recorded by other agencies but not processed or reported to the laboratory. Several specimens were processed through the laboratory before a lab protocol was established. The record may be incomplete for these specimens.

Table 14. Wolf mortalities recorded through the MDFWP laboratory, 1956-90.

Year	Lab No.	Sex	Age	Weight (lbs.)	Cause of Death
1956	None	M	Ad.	86	Mistaken ID
1974	177049	F	5	--	Natural (skull found)
1978	177740	F	Ad.	83	Fatal Gun Shot
1981	178620	M	Ad.	110	Animal Control
1987	179649	M	4	101	Animal Control
1987	179656	F	Pup	39	Animal Control
1987	179657	M	Pup	58	Animal Control
1987	179659	F	4	--	Trapped
1988	179737	M	3	64	Roadkill
1989	179878	M	2	107	Animal Control
1989	179920	F	Pup	27	Relocation/Starvation
1989	179921	F	Pup	30	Relocation/Starvation
1989	None	M	Ad.	--	Illegal
1989	179946	M	2	--	Unknown (B.C.)
1990	180044	F	1	62	Animal Control
1990	None	F	Ad.	--	Relocated/Illegal
1990	None	M	Ad.	--	Roadkill

Seventeen wolves have been killed in Montana during the period 1956-90. Most of these wolves were killed since 1987 when wolf pack activity began in Northwest Montana. Nine of the mortalities were male while eight were female.

Many of the earlier records came from northeastern Montana while the later records come from northcentral and northwestern Montana. All records come from near the Canadian Border with the exception of a roadkill near Yellowstone National Park. Necropsy results of the latter animal indicated that it may have recently escaped or been released from captivity.

Grizzly Bear Studies

Disposition of 1989 Grizzly Carcasses

The annual summary of grizzly bear mortalities in 1989 is reported in Pac and Dood (1990). A total of 15 known and one probable mortality were reported for the year. Parts were obtained from 12 of the 15 known mortalities during the year 1989. Four entire carcasses were brought to the laboratory for processing. The remaining eight produced either skull, hide, or claws for cleaning and/or tanning. Five of the 12 carcasses did not result in a hide for salvage. Seven complete or partial hides were fleshed and dried. Two of these were held as evidence for USFWS cases, two were retained for MDFWP use, and three were distributed to USFWS and GNP for various purposes. Nine grizzly bear skulls were salvaged from 1989. Two skulls are being held as evidence in pending enforcement cases, four were distributed to various agencies, and three were retained for the laboratory collection.

Laboratory Examination of Grizzly Bear

A formal laboratory protocol was established during the report period for all grizzly bear mortalities processed through the laboratory. The processing calls for recording the physical characteristics, formal examination of each carcass by lab biologists and veterinary pathologists, retention of entrails for parasitology evaluation, harvesting tissue for genetics study, collection of reproductive tracts, collection of blood when possible, the salvage of hides and skulls, and the careful collection of forensic evidence. The forearm from all snared grizzlies are also retained for later X-ray and examination to determine injuries, if any, of captured bears. All skulls are cleaned, measured, and then photographed for the record.

Four complete or partial grizzly bear carcasses were processed in 1989 and eight for the report period in 1990. Necropsies

were performed on three carcasses provided to the laboratory from 1989 mortalities and five from 1990 mortalities. Entrails were retained from eight of the carcasses for parasitology examinations. Stomach contents were examined in four of the five specimens processed. Full laboratory reports were prepared in seven mortality cases.

Grizzly Relocations 1989

In the Northern Continental Divide and Yellowstone Ecosystems, records of relocations were compiled from capture forms provided by field personnel. The Interagency reports for each relocation were not available for review, so records here may be incomplete. These data represent only relocations of problem bears and are not summarizations of all problem incidents reported and investigated.

In the Northern Ecosystem during 1989, 14 individual grizzly bears were relocated following 11 problem incidents. This contrasts with only three relocations during three problem incidents on record for 1988. The 1989 bears included eight individual females and six males. Five of the bears were cubs, three were subadults, and six were adults.

Eleven grizzlies were captured and relocated east of the Continental Divide while three were captured and relocated west of the Continental Divide. Two individuals were relocated twice during the year while 12 were captured and relocated one time. Two family groups, a female with three cubs and a female with two cubs, were relocated during the year. One bear (#518/519) was captured in the North Fork Flathead during the season but was not relocated and is not included in the total.

One relocated bear (#51/52) was illegally killed after being captured and relocated twice in 1989. The remaining bears were presumed to survive and den. Radio relocation efforts were limited on many relocated problem bears, and the actual fate of several bears is not known. Recent information shows that all of the bears relocated moved away from the release site. All relocations east of the divide resulted in bears returning to their home range or being killed on route. One of the three relocations from west of the divide resulted in a bear partially returning to its home range while the fate of the other two is not known.

Ten of the relocation efforts were conducted in September and October. Two were conducted in May, one in July, and one in August.

No reports of captured or relocated grizzly bears from Montana were on record for the Yellowstone Ecosystem. Records indicate several relocations occurred within the Park and in Wyoming.

RECOMMENDATIONS

The wildlife laboratory services should be continued. Sufficient flexibility should be maintained in order to be able to readily respond to changing needs of Department wildlife management and research biologists.

Work emphasis should be directed at building computer data files from large raw data compilations so that information is more readily available to biologists and managers. Computer assisted data analysis should be conducted to publish and distribute data on many topics of interest including mountain lion harvest data, food habits, reproductive performance of selected species, disease and parasites of selected wildlife, and blood profiles.

Pine marten carcass collections should continue. However, the funding of this program should be more specifically directed to the laboratory so that budgeting and manpower planning can be more easily conducted.

The mountain lion trophy process should be modified to help speed processing of hunter killed lions. A clear copy of the trophy form should be immediately sent to the laboratory as well as Helena and the regions so that processing can be conducted on each specimen immediately. Under the current process the laboratory must wait for trophy forms to be transmitted from Helena Enforcement Division after they have completed their use of the forms. This delay prevents immediate processing and delivery of processed skulls until the trophy sheet arrives from Helena.

A bobcat skull collection process should be developed if additional regions participate in bobcat skull collections. The current situation results in many bobcat skulls with limited information as to the sex, location of kill, date of kill, or name and address of trapper. A tagging process similar to that used for mountain lions should be considered to assure correct tagging and reference marking of each specimen.

The establishment of a protocol for processing grizzly bear carcasses has the potential to greatly increase our knowledge of bears. All carcasses which can be reasonably obtained from the field should be immediately transported to the laboratory or frozen for later examination. A concerted effort by all

regions involved will be necessary and complete cooperation from field personnel will be essential. The potential exists for functional anatomy study and serious disease and parasitology studies with the materials available from the field.

Relocating grizzly bears to resolve human/bear conflict is frequently applied in both the Yellowstone and Northern Continental Divide Ecosystems. Record keeping in the Northern Continental Divide is not often available for consistent review and analysis. It is recommended that copies of problem bear capture forms, flight reports, and interagency nuisance report forms from the NCDE be forwarded to the Wildlife Laboratory for filing and record keeping. Annual summaries of the information should be completed. This will provide accurate and long term record keeping of relocation efforts for review by grizzly bear managers.

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